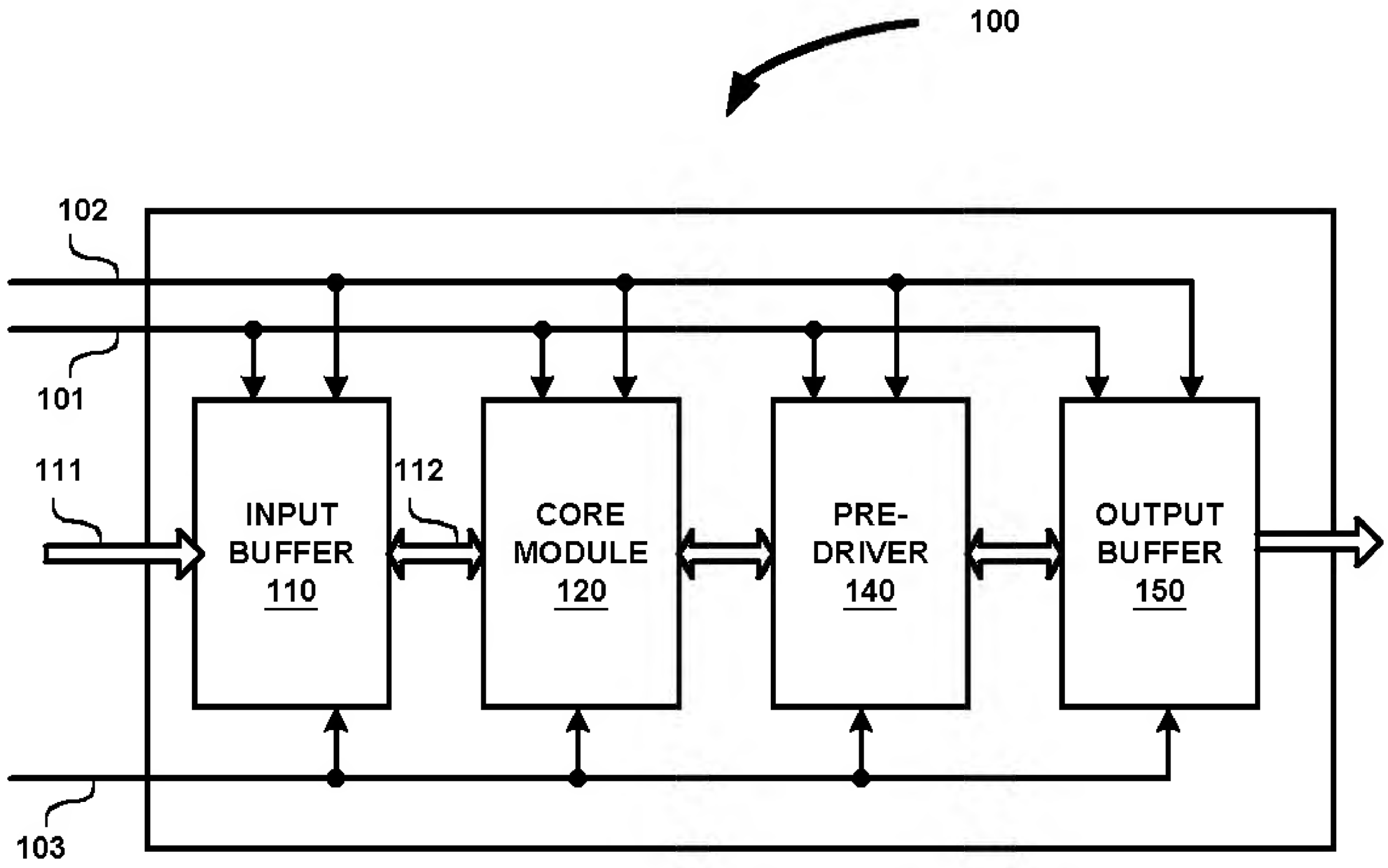
100
102
101
111
112
INPUT BUFFER 110
CORE MODULE 120
PRE-DRIVER 140
OUTPUT BUFFER 150
103

FIG. 1A

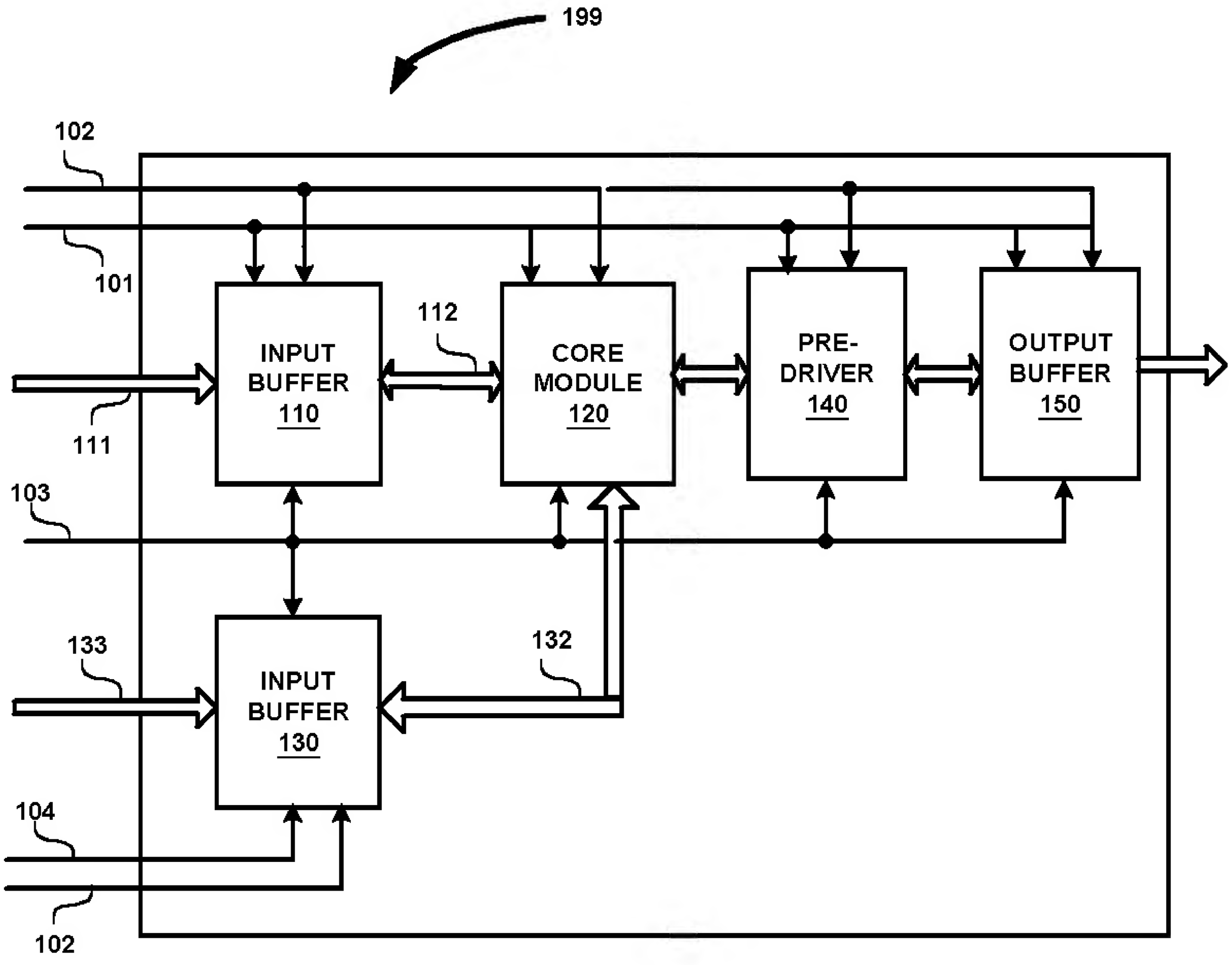
199
102
101
111
112
103
133
132
104
102
INPUT BUFFER 110
CORE MODULE 120
PRE-DRIVER 140
OUTPUT BUFFER 150
INPUT BUFFER 130

FIG. 1B

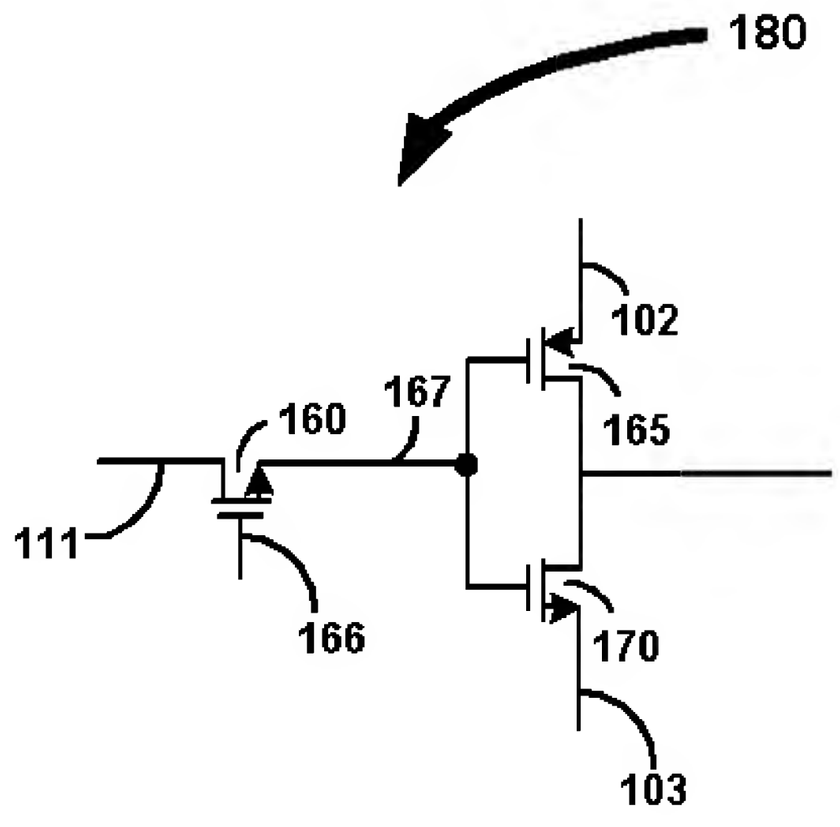

FIG. 1C (Prior Art)

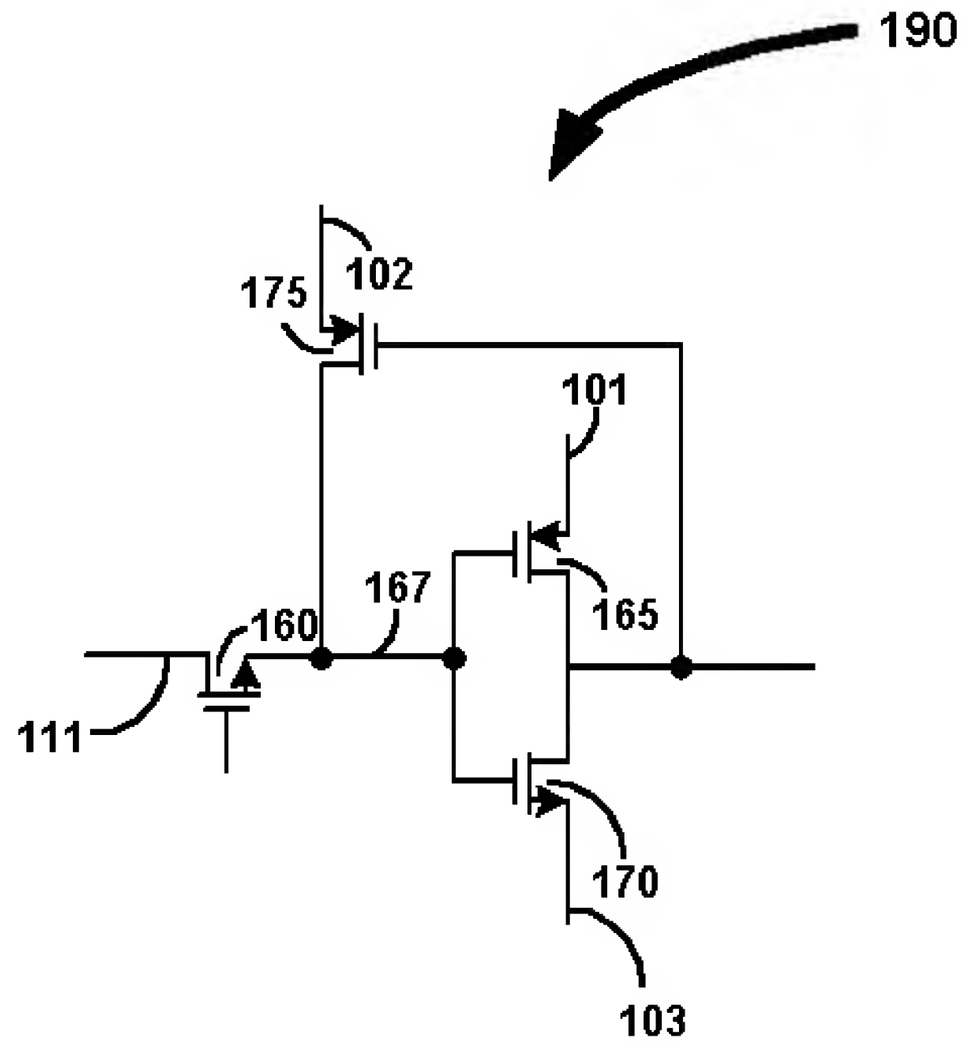

FIG. 1D (Prior Art)

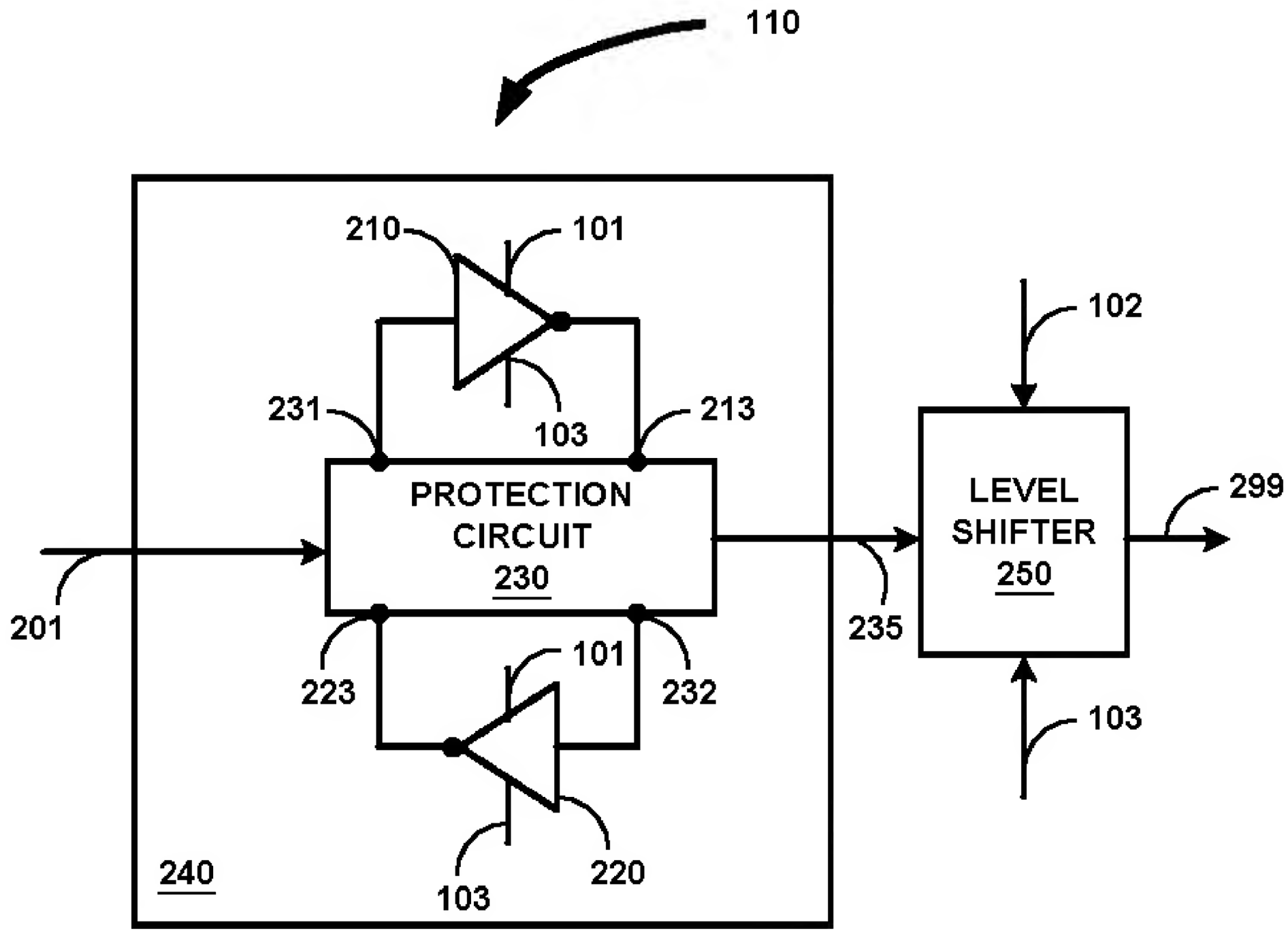
110
210
101
231
213
103
PROTECTION
CIRCUIT
230
201
223
232
101
240
103
220
102
LEVEL
SHIFTER
250
299
235
103

FIG. 2

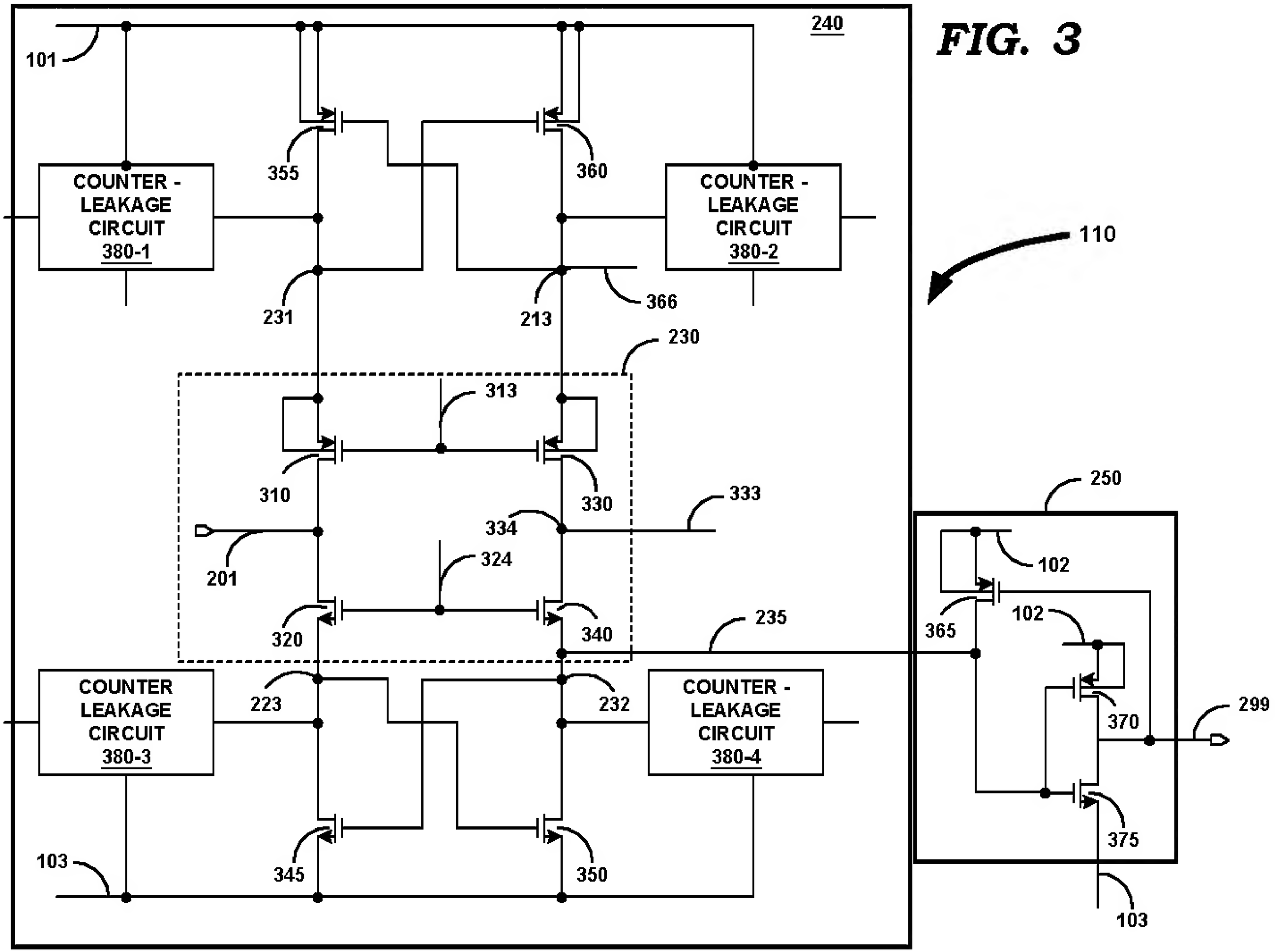
240
101
355
360
COUNTER - LEAKAGE CIRCUIT 380-1
COUNTER - LEAKAGE CIRCUIT 380-2
231
213
366
230
313
310
330
333
334
201
324
320
340
235
COUNTER LEAKAGE CIRCUIT 380-3
223
232
COUNTER - LEAKAGE CIRCUIT 380-4
345
350
103
110
250
102
365
102
370
299
375
103

FIG. 3

	Cross Terminals	Voltage value	Comments
410-1	Vds of transistor 345	BIASN-Vt-Vss	Protected due to turn off of transistor 320
410-2	Vdg of transistor 345	BIASN-Vt-Vss	Protected due to turn off of transistor 320
410-3	Vgs of transistor 350	BIASN-Vt-Vss	Protected due to turn off of transistor 320
410-4	Vdg of transistor 350	BIASN-Vt-Vss	Protected due to turn off of transistor 320
410-5	Vds of transistor 360	HVDD-BIASP-Vt	Protected due to turn off of transistor 330
410-6	Vdg of transistor 360	HVDD-BIASP-Vt	Protected due to turn off of transistor 330
410-7	Vgs of transistor 355	HVDD-BIASP-Vt	Protected due to turn off of transistor 330
410-8	Vdg of transistor 355	HVDD-BIASP-Vt	Protected due to turn off of transistor 330

FIG. 4A

	Cross Terminals	Voltage value	Comments
430-1	Vgs of transistor 345	BIASN-Vt-Vss	Protected due to turn off of transistor 340
430-2	Vdg of transistor 345	BIASN-Vt-Vss	Protected due to turn off of transistor 340
430-3	Vds of transistor 350	BIASN-Vt-Vss	Protected due to turn off of transistor 340
430-4	Vdg of transistor 350	BIASN-Vt-Vss	Protected due to turn off of transistor 340
430-5	Vgs of transistor 360	HVDD-BIASP-Vt	Protected due to turn off of transistor 310
430-6	Vdg of transistor 360	HVDD-BIASP-Vt	Protected due to turn off of transistor 310
430-7	Vds of transistor 355	HVDD-BIASP-Vt	Protected due to turn off of transistor 310
430-8	Vdg of transistor 355	HVDD-BIASP-Vt	Protected due to turn off of transistor 310

FIG. 4B

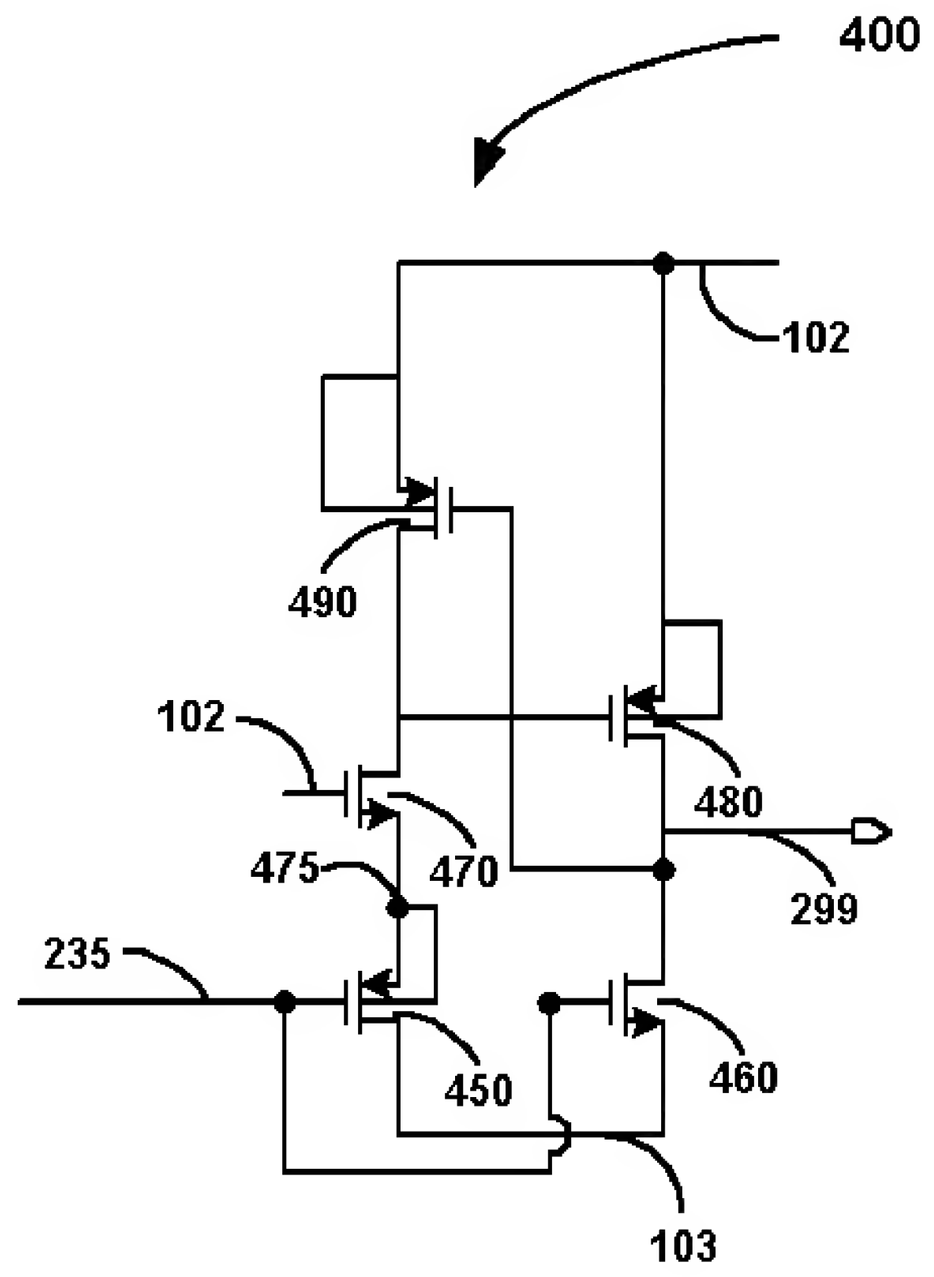

FIG. 4C

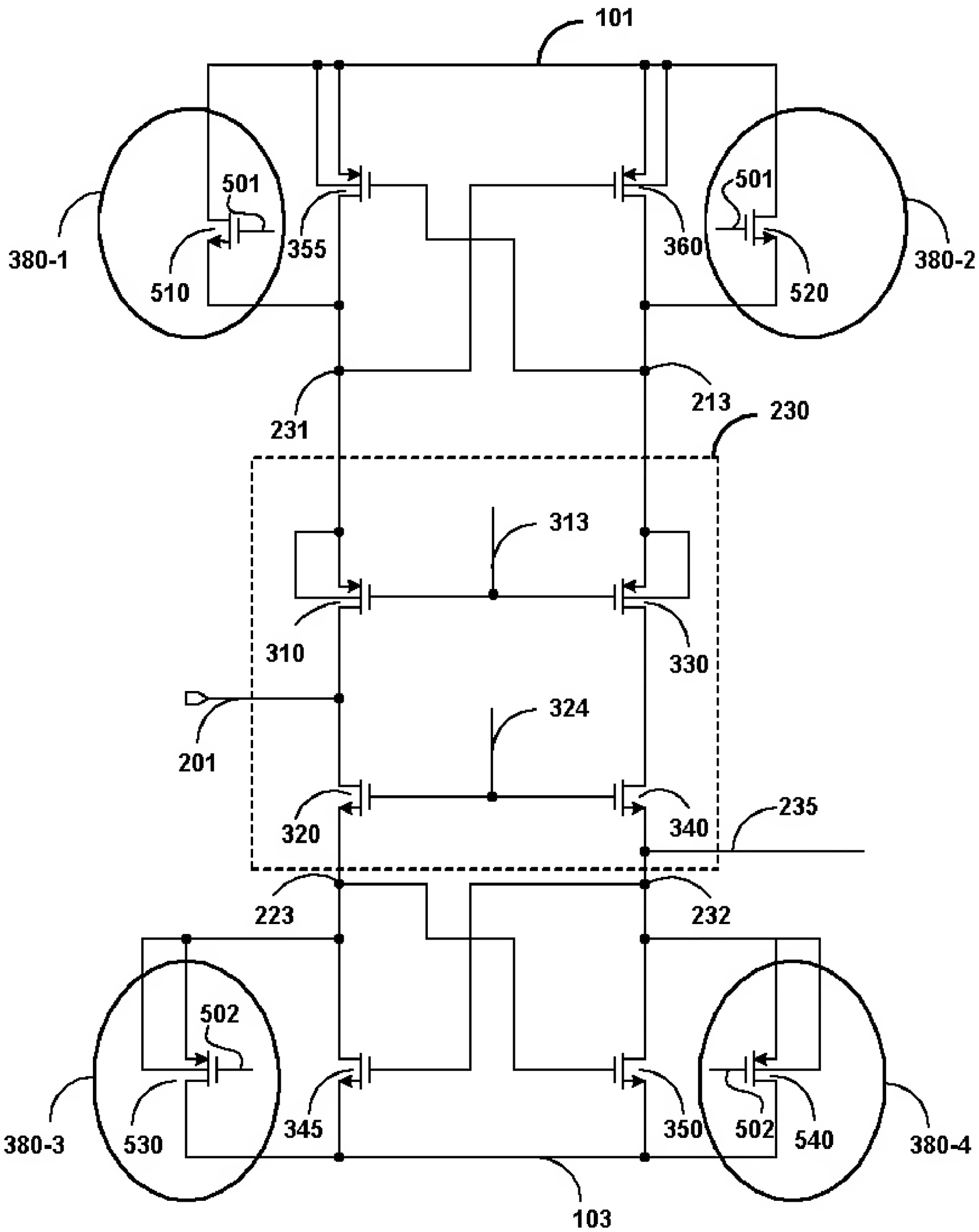
101
501
380-1
355
360
501
380-2
510
520
231
213
230
313
310
330
201
324
320
340
235
223
232
502
380-3
530
345
350
502
540
380-4
103

FIG. 5

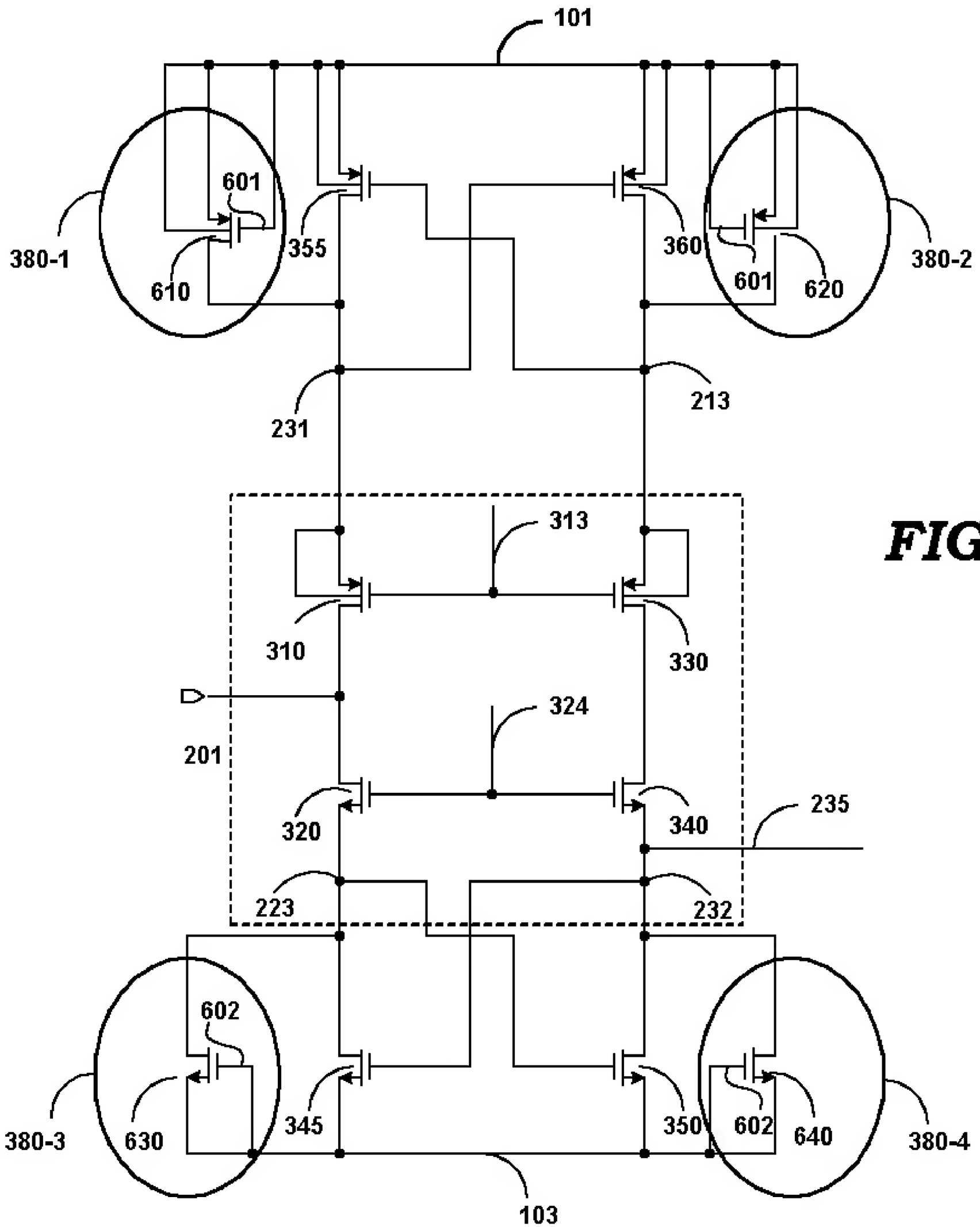
101
601
380-1
355
360
380-2
610
601
620
231
213
313
310
330
324
201
320
340
235
223
232
602
380-3
630
345
350
602
640
380-4
103

FIG. 6

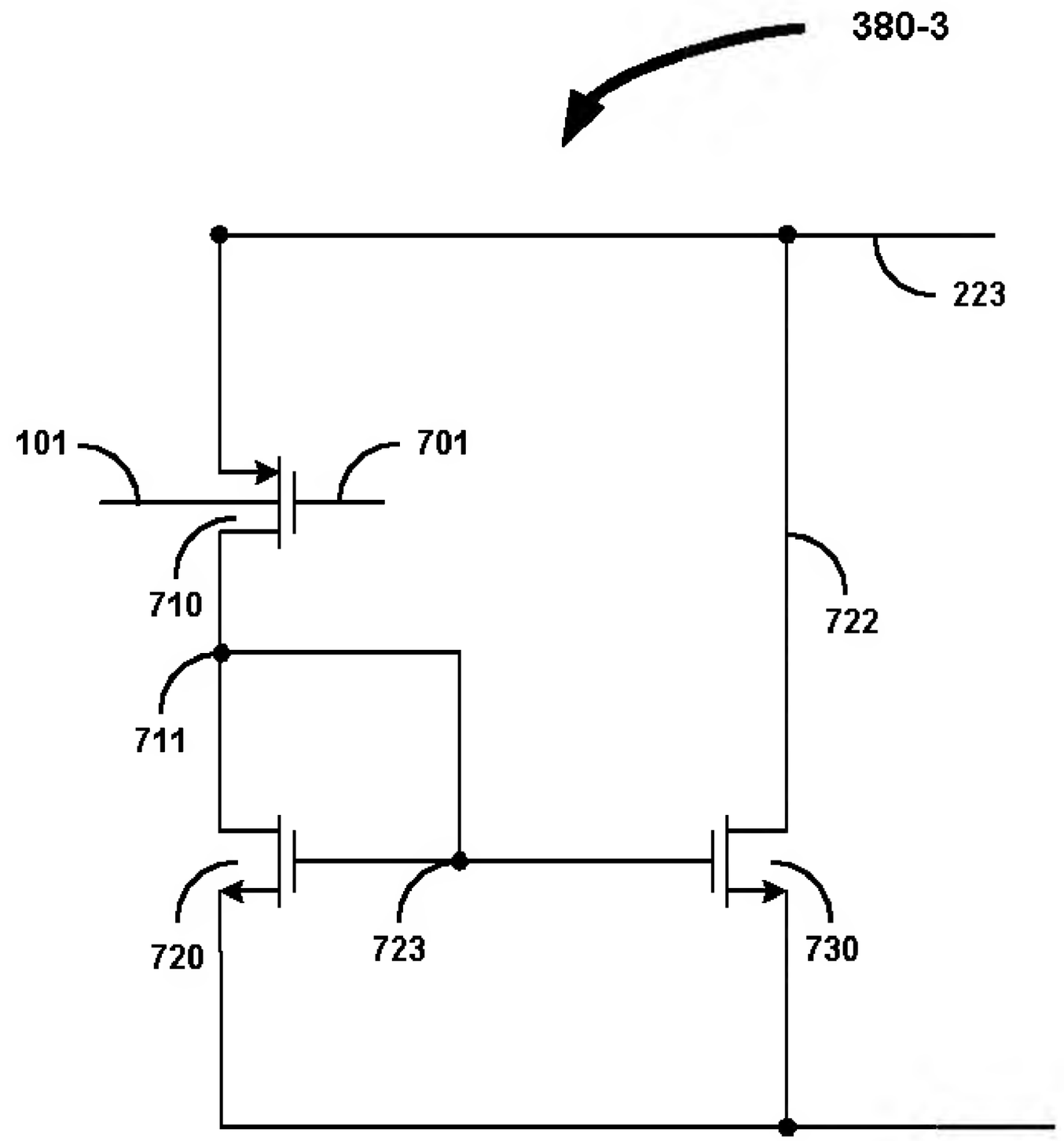

FIG. 7

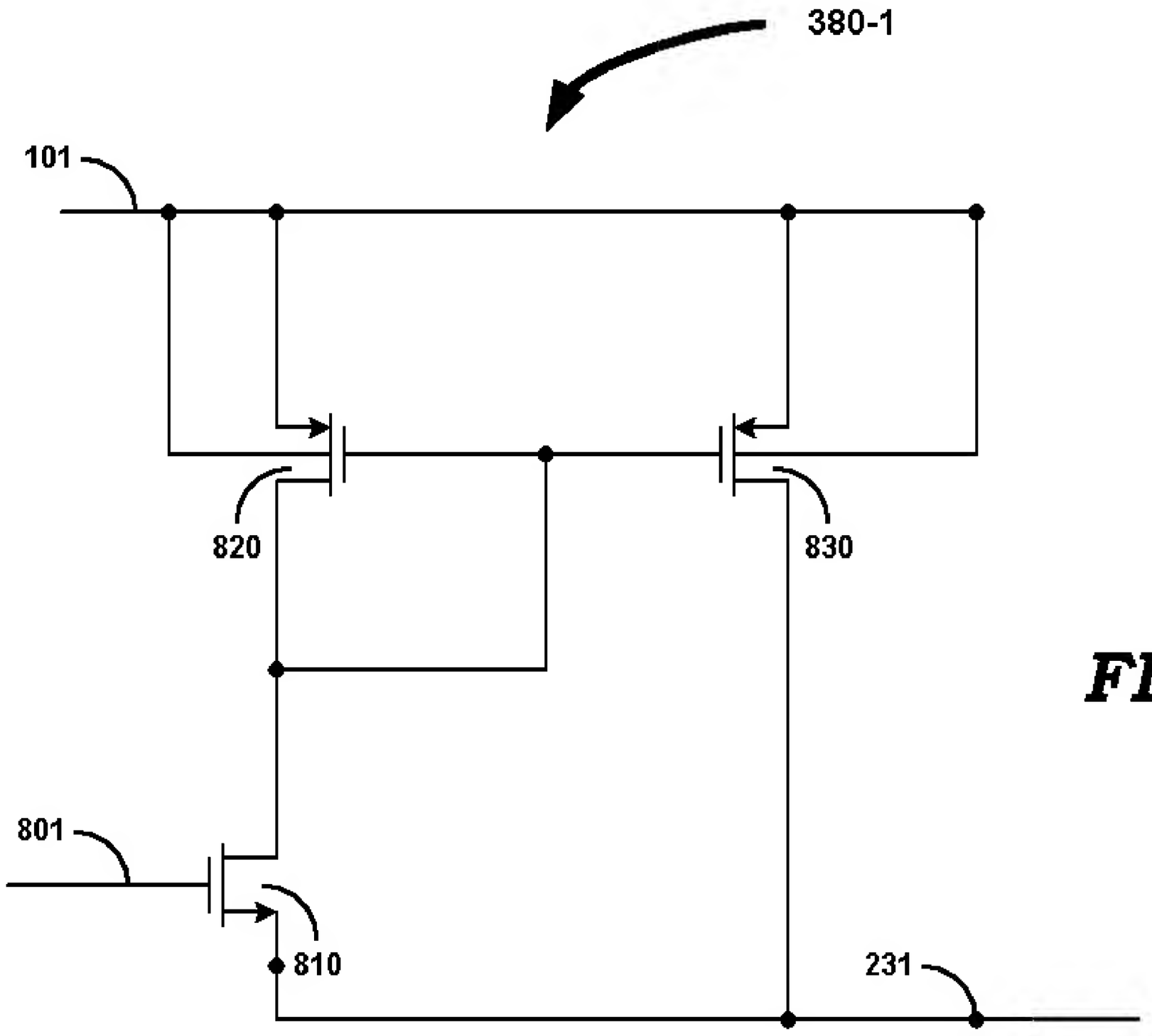

FIG. 8

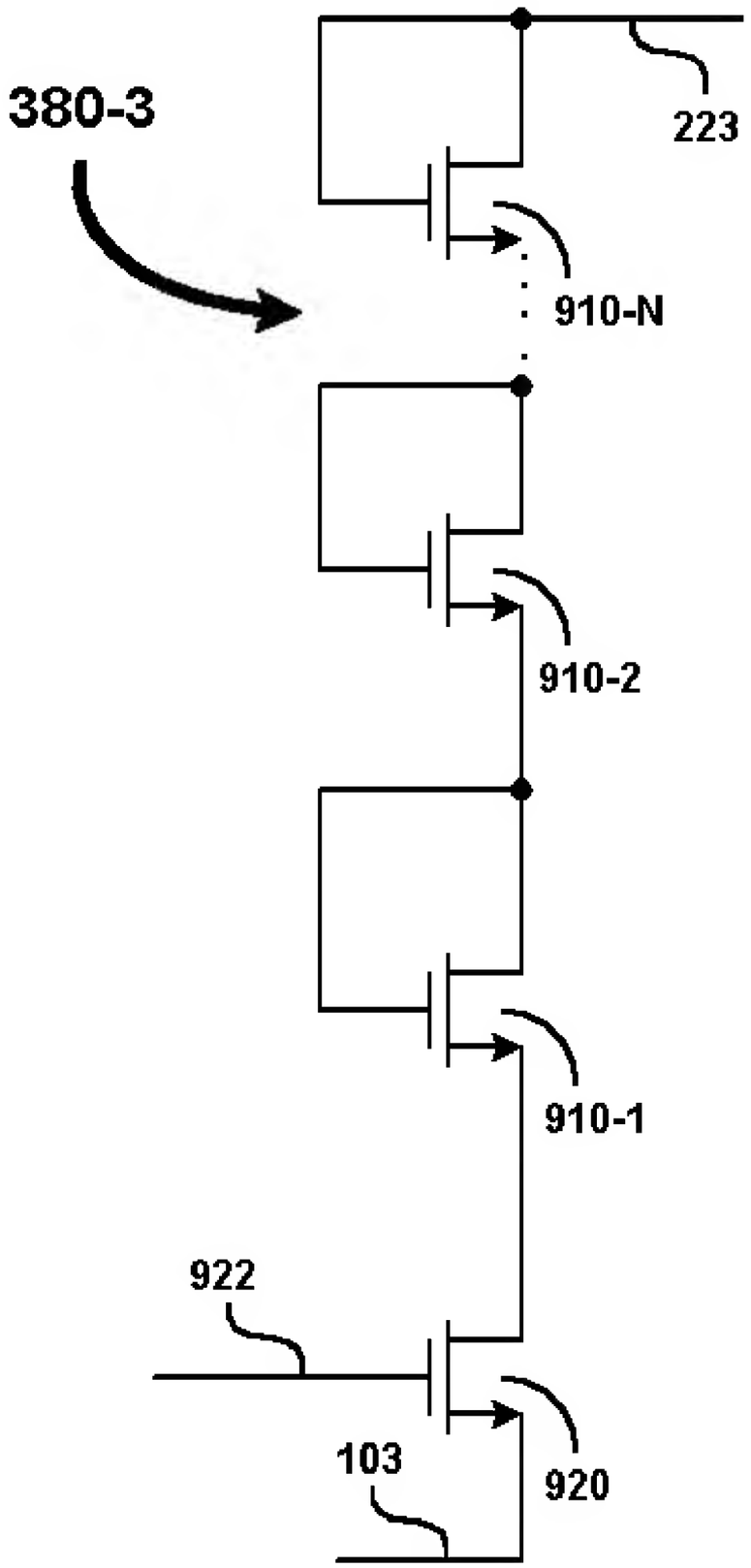
380-3
223
910-N
910-2
910-1
922
103
920

FIG. 9

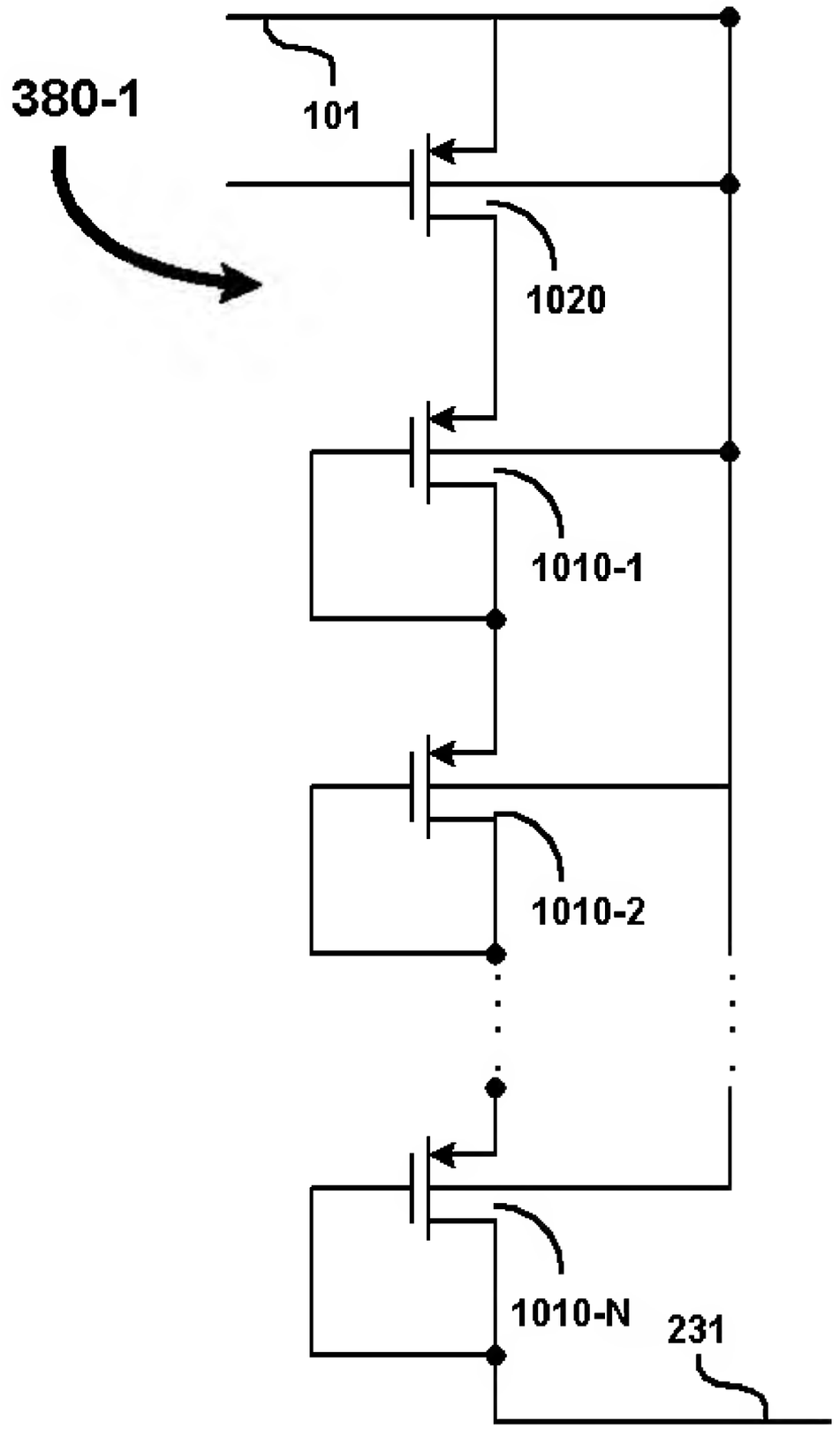
380-1
101
1020
1010-1
1010-2
1010-N
231

FIG. 10

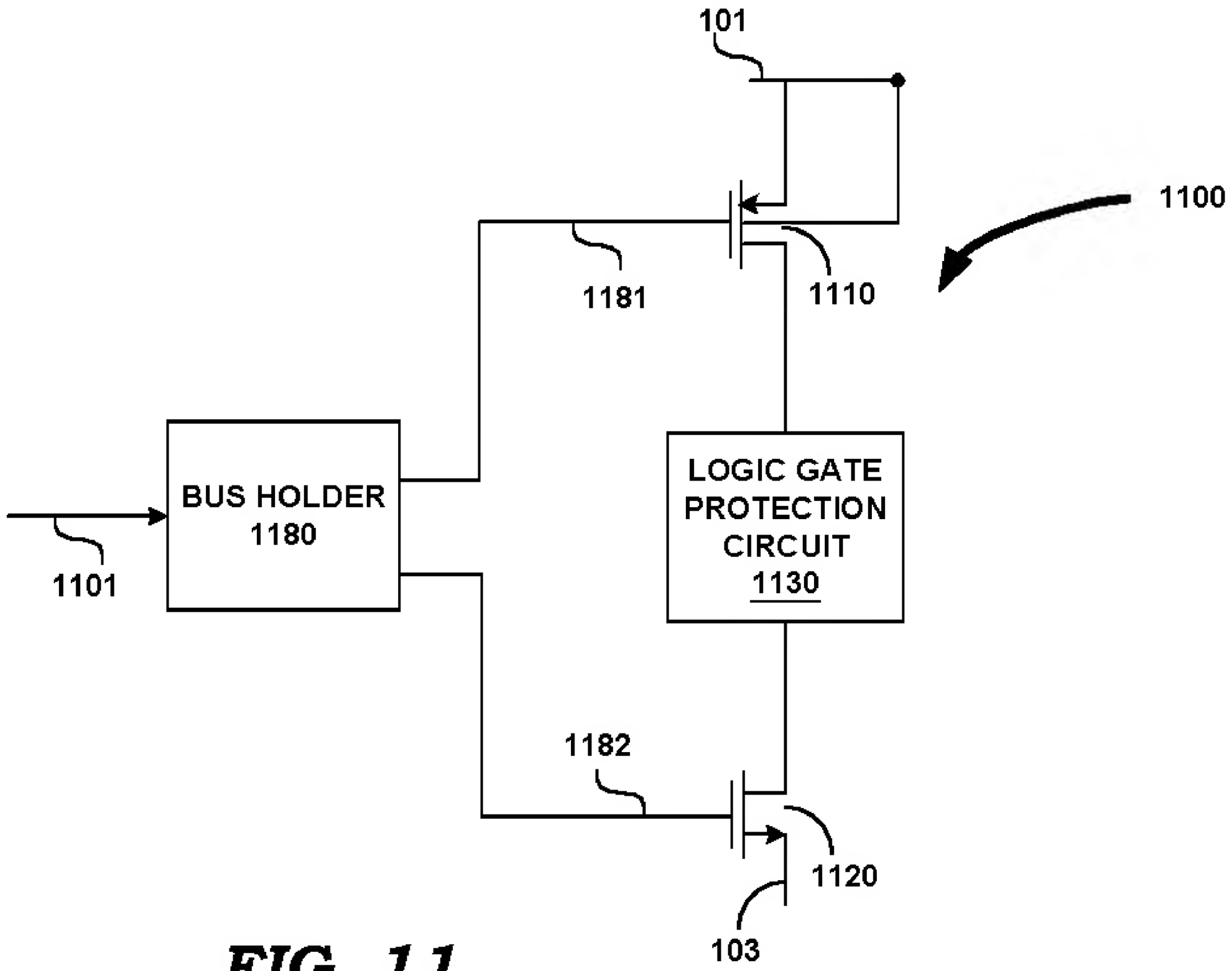
101
1100
1181
1110
BUS HOLDER
1180
1101
LOGIC GATE
PROTECTION
CIRCUIT
1130
1182
1120
103

FIG. 11

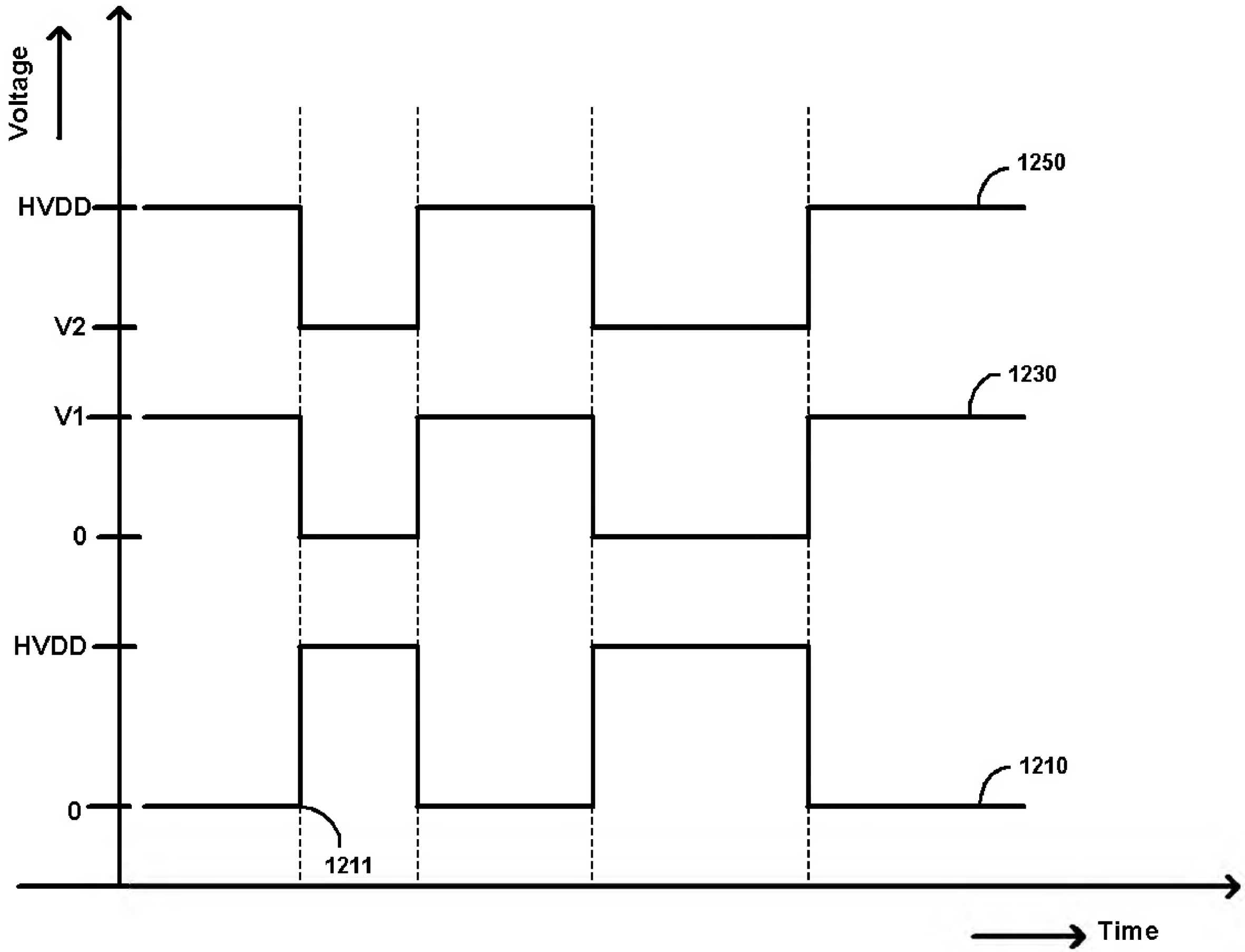

FIG. 12

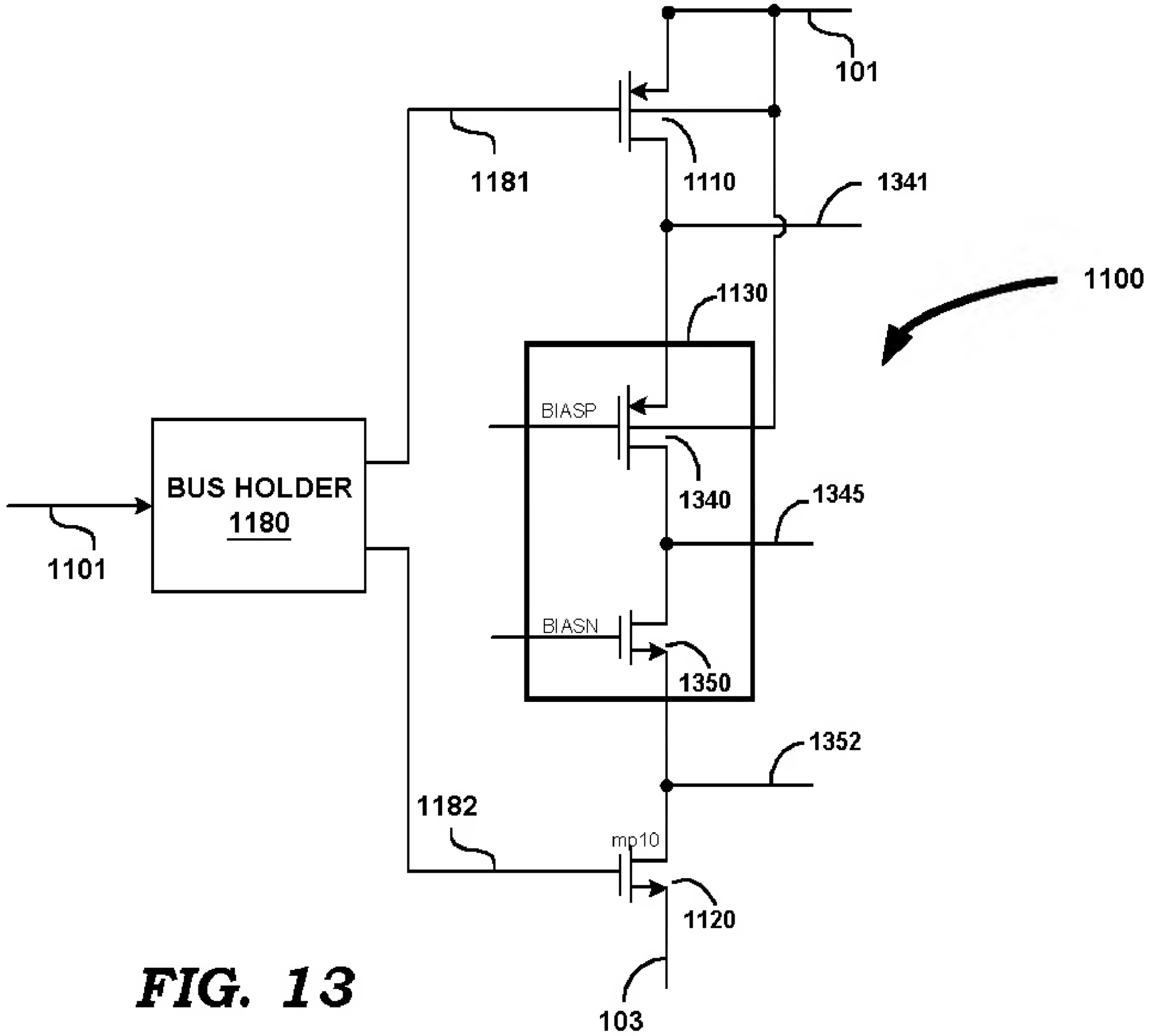
101
1181
1110
1341
1100
1130
BIASP
BUS HOLDER
1180
1340
1345
1101
BIASN
1350
1352
1182
mp10
1120
103

FIG. 13

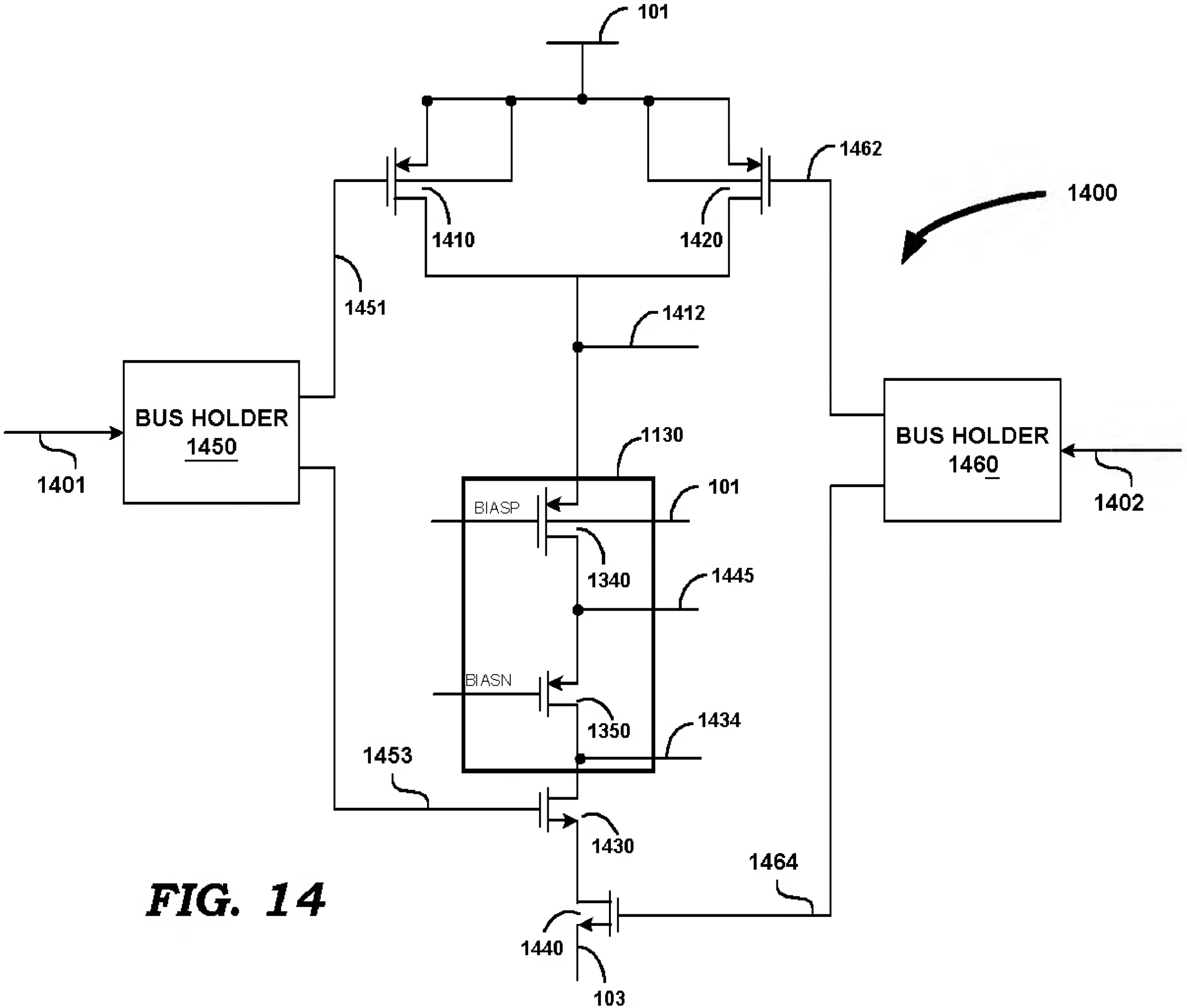
101
1462
1400
1410
1420
1451
1412
BUS HOLDER
1450
1401
1130
101
BIASP
1340
1445
BUS HOLDER
1460
1402
BIASN
1350
1434
1453
1430
1464
1440
103

FIG. 14

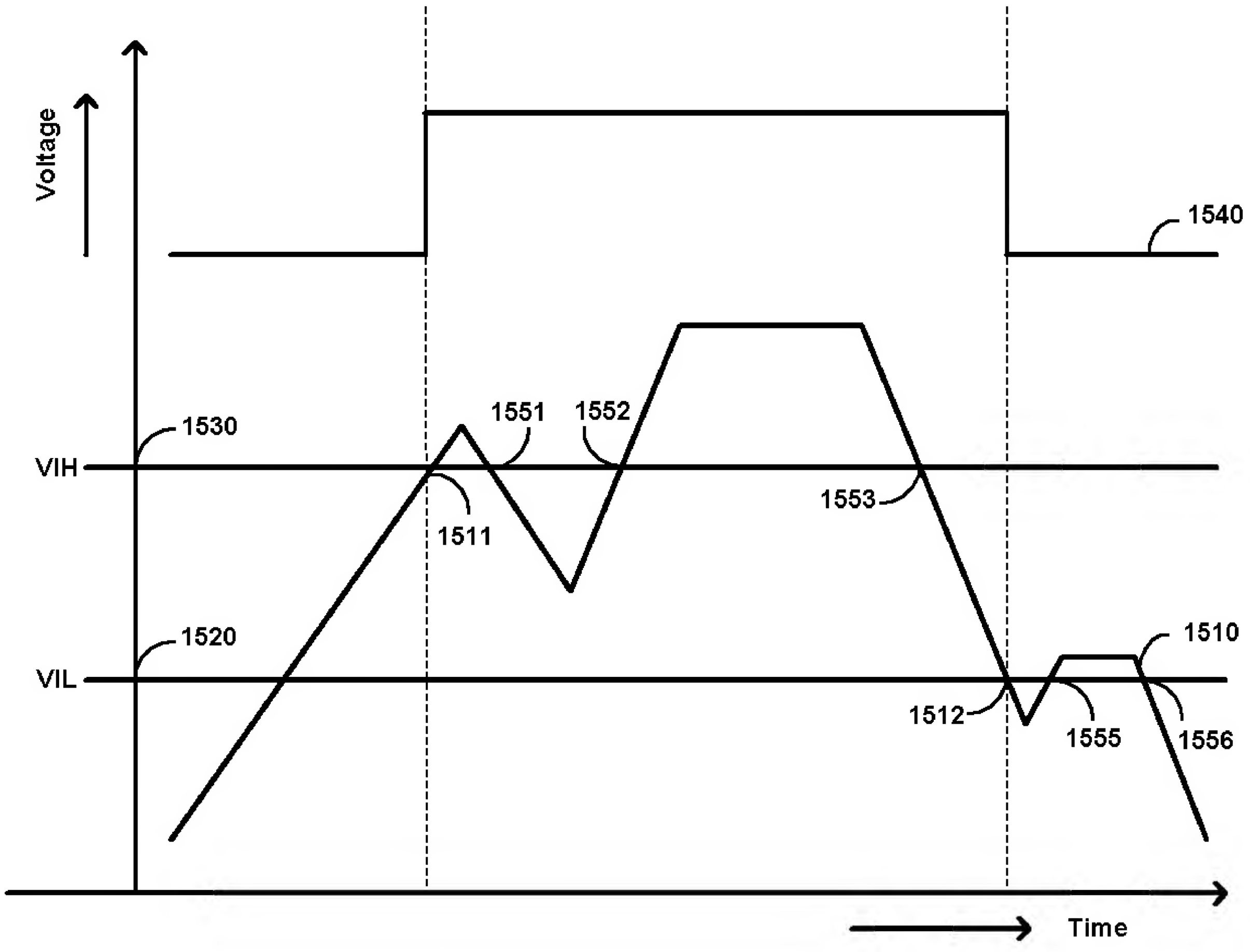
Voltage
1540
1530
1551
1552
VIH
1553
1511
1520
1510
VIL
1512
1555
1556
Time

FIG. 15

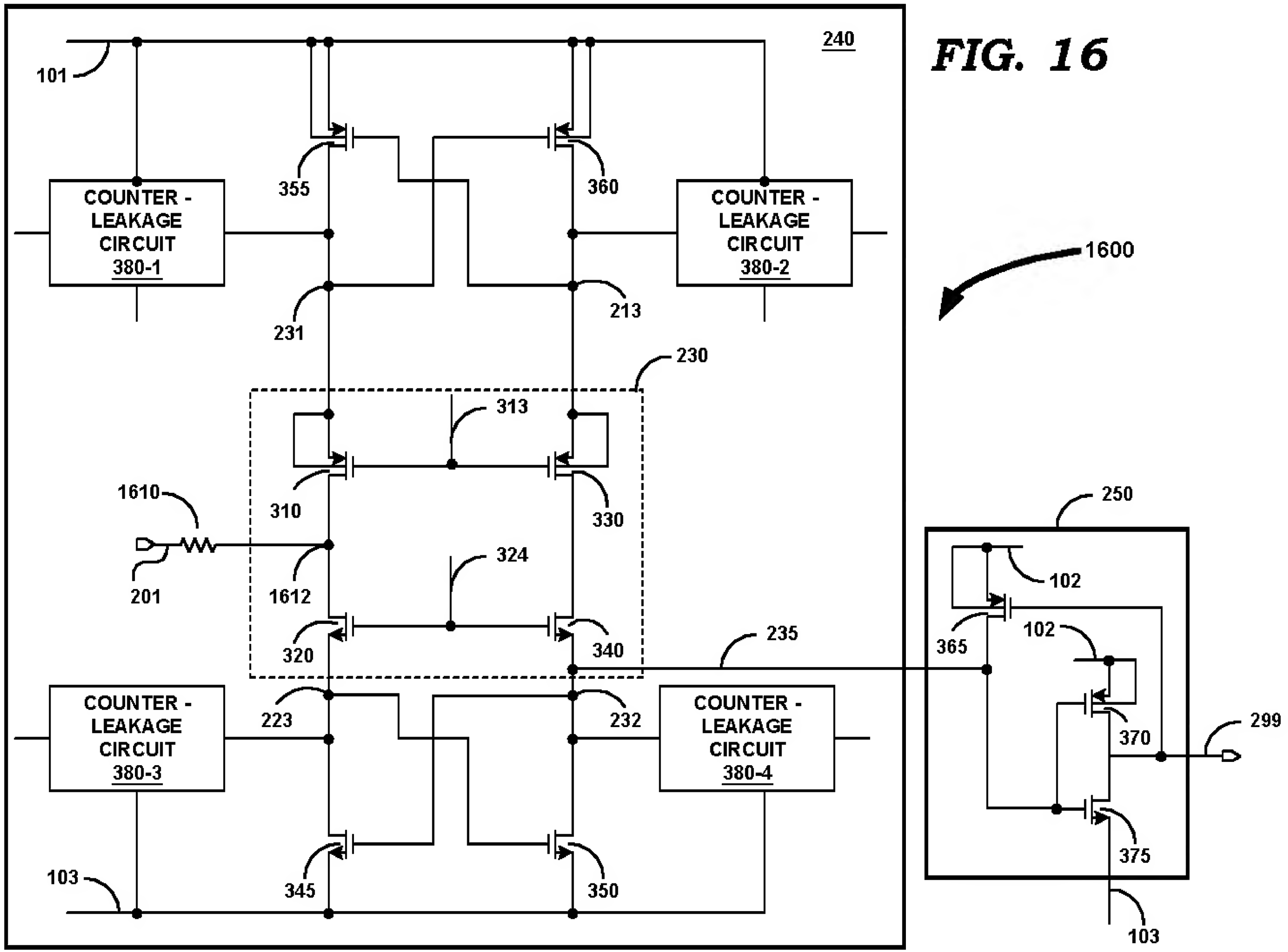
240
101
355
360
COUNTER - LEAKAGE CIRCUIT 380-1
COUNTER - LEAKAGE CIRCUIT 380-2
231
213
230
313
1610
310
330
201
1612
324
320
340
235
COUNTER - LEAKAGE CIRCUIT 380-3
223
232
COUNTER - LEAKAGE CIRCUIT 380-4
345
350
103
250
102
365
102
370
299
375
103
1600

FIG. 16

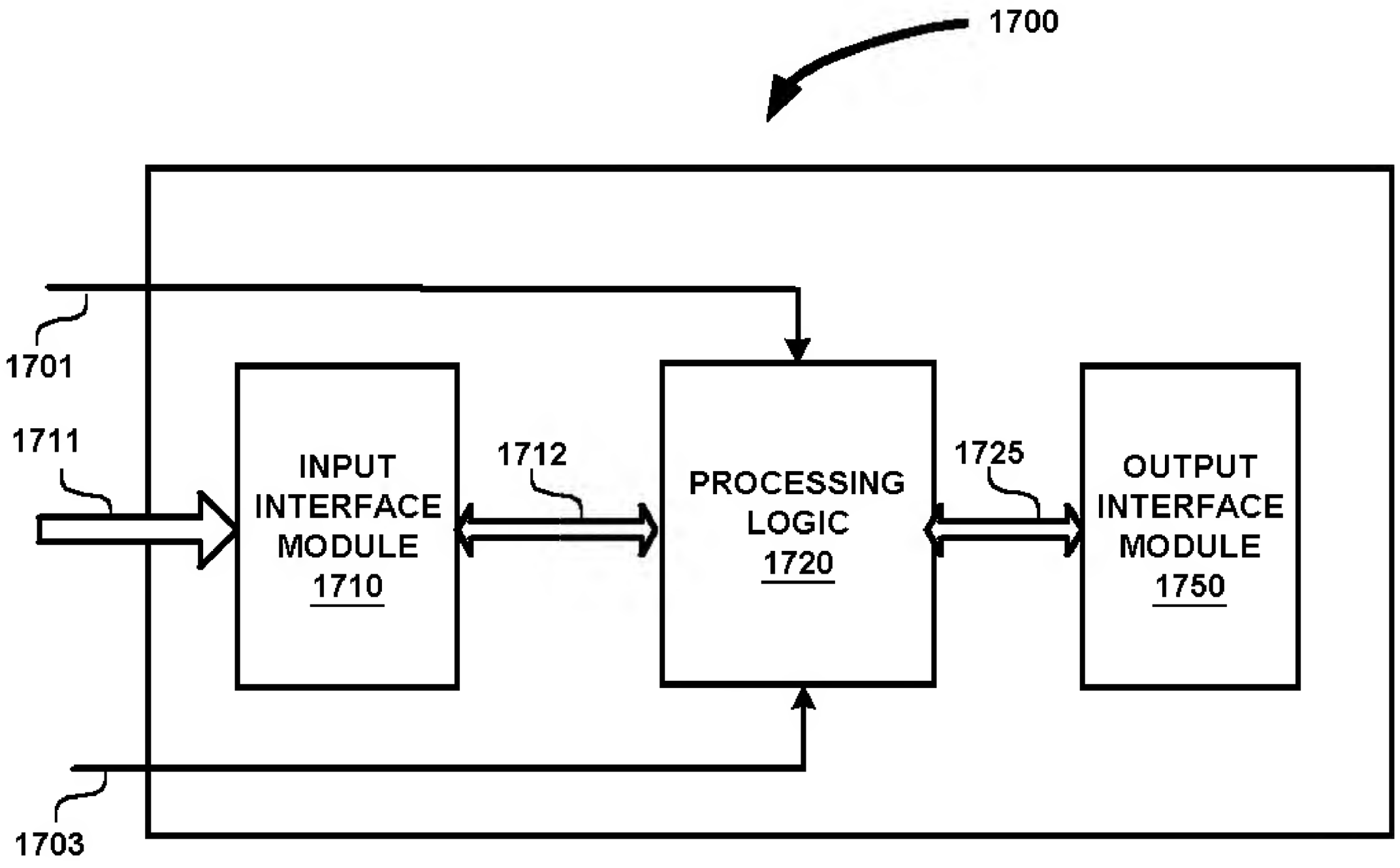
1700
1701
1711
INPUT INTERFACE MODULE 1710
1712
PROCESSING LOGIC 1720
1725
OUTPUT INTERFACE MODULE 1750
1703

FIG. 17